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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/994,342
Filing Date: November 26, 2001
Appellant(s): LAMPHERE ET AL.

Gunther Evanina
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 22 August 2005 appealing from the Office action mailed 23 May 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,851,090	BRUNS et al	7-1989
5,641,391	HUNTER et al	6-1997
JP 02-145217 A	MITSUHARU	6-1990

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

[reproduced from the final rejection, with the exception of the paragraphs regarding claims 6 and 15. The rejections of claims 6 and 15 are changed to correct a typographical error to recite the proper lines of col. 5 of the Bruns reference.]

---Claims 1, 2, 11-15 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruns et al (US 4,851,090) in view of Hunter et al (US 5,641,391) and Mitsuharu (JP 02-145217).

Bruns et al teach (see abstract and Figures 1-18) a method of and apparatus for electrochemically machining a blisk.

Regarding claim 1, the method includes steps of mounting the blisk in a multiaxis electrochemical machine, followed by electrochemically machining a first row of blades. Thus, Bruns et al fail to teach performing a second electrochemical machining to create a second row of blades while the blisk is still mounted in the machine.

However:

(1) Hunter et al teach (see col. 10, lines 4-12) that using multiple electrodes allows increased speed of fabrication and allowing for multiple electrode geometries. Thus, the advantage of using multiple electrodes is increased efficiency and the ability to electrochemically machine two shapes while the part is not removed from the machine. Hunter et al is considered reasonably pertinent to the problem because Hunter et al relate to simultaneous formation of two different geometries in electrolytic etching (i.e.-machining).

(2) Mitsuharu teaches (see abstract and figures) a method where two electrodes are used to electric discharge machine a single part by having independent movement of the two electrodes. Mitsuharu is considered reasonably pertinent to the problem because Mistuharu teaches an apparatus capable of performing two types of machining of blades on a single blisk.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a second step of electrochemical machining as taught by Mitsuharu to the method of Bruns et al without removing the blisk from the machine for the purpose of increased efficiency and allowing different machined geometries as taught by Hunter et al.

Regarding claim 11, the apparatus includes means for mounting the blisk and means for electrochemically machining a row of blades. Thus, Bruns et al fail to teach a means for electrochemically machining a second row of blades while the blisk is still mounted in the machine.

However:

(1) Hunter et al teach (see col. 10, lines 4-12) that using multiple electrodes allows increased speed of fabrication and allowing for multiple electrode geometries. Thus, the advantage of using multiple electrodes is increased efficiency and the ability to electrochemically machine two shapes while the part is not removed from the machine.

(2) Mitsuharu teaches (see abstract and figures) a method where two electrodes are used to electric discharge machine a single part by having independent movement of the two electrodes.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a second means for electrochemical machining as taught by Mitsuharu to the apparatus of Bruns et al without removing the blisk from the machine for the purpose of increased efficiency and allowing different machined geometries as taught by Hunter et al.

Regarding claims 2 and 12, Bruns et al teach moving the blisk into a pair of electrodes. However, Bruns et al does not teach using two pairs of electrodes. Therefore, it would have been obvious to one of ordinary skill in the art to have added either a second step or second means for moving the blisk into the second pair of electrodes as taught by Hunter et al and Mitsuharu because the second movement means would allow for easily moving the blisk into position to be machined by the second electrodes.

Regarding claim 13, it would have been within the expected skill of a routineer in the art to have set the two machining electrodes in different locations (planes) within the machine as the apparatus itself is bulky and it would be highly difficult to arrange the second means such that it would not interfere with the first means. By setting up the two means in different planes relative to each other, a routineer in the art would have added means for translating the position of the blisk from one means to the other.

Regarding claim 14, it would have been within the expected skill of a routineer in the art to have set up the two machining electrodes to be movable into communication with a fixed blisk because each machining electrode means is bulky and would interfere with the other means. Thus, each of the machining electrodes would require translating means.

Regarding claim 15, Bruns et al teach (see col. 5, lines 20-40) rotating the electrodes during machining. Thus, Bruns et al disclose means for rotating the electrode pairs during machining.

Regarding claim 18, Bruns et al teach means for mounting the blisk and a pair of electrode tools with means for translating the tools in two axes and rotating about a third. However, Bruns et al do not teach the second pair of electrodes with translating/rotating means nor the means for translating the blisk from one electrode tool to the other. Hunter et al and Mitsuharu, as above, teach duplicating the electrode tool to increase efficiency and allow for multiple, different geometries to be machined without additional set-up. Thus, by duplicating the electrode tool, there would be a second means for translating the tools in two axes and rotating about a third. In order to space the two electrode tools sufficiently far apart to allow for the blisk to be placed in the machine, one of ordinary skill in the art would have been motivated to have included a means for translating the blisk along a "seventh" axis towards each of the two electrode tools.

Regarding claim 19, the apparatus of Bruns et al included means (24) for rotating the blisk to sequentially position the blades between the electrodes. It would have been

within the expected skill of a routineer in the art to have set up the two machining electrodes in different locations (planes) within the machine as the apparatus itself is bulky and it would be highly difficult to arrange the second means such that it would not interfere with the first means. By setting up the two means in different planes relative to each other, a routineer in the art would have added means for translating the position of the blisk from one means to the other.

Regarding claim 20, Bruns et al teach a method comprising electrochemically machining a first row of blades. However, Hunter et al and Mitsuharu, as above, teach adding a second set of electrode tools to machine a second row of blades without removing the blisk from the machine and without "re-setting up" the tools between the two sequences. One of ordinary skill in the art would have found it obvious to perform the known "set-up" process for both sets of tools at the same time instead of performing a "re-set-up" process after the end of the first machining step.

---Claims 3-10, 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruns et al in view of Hunter et al and Mitsuharu as applied to claims 1, 2, 11-15 and 18-20 above, and further in view of Applicant's admission of prior art.

The teachings of Bruns et al in view of Hunter et al and Mitsuharu are described above.

These references do not teach the claimed method of setting up the machine.

Regarding claims 3 and 17, Applicant admits as prior art (see paragraphs 12-14) that the steps of setting up the apparatus of Bruns et al includes a first machining step on a scrap blisk (i.e.-sample), removing the blisk to inspect for dimensional tolerances

and comparing the dimensions to the desired final dimensions. These steps are repeated until the blisk achieves the final desired dimensions. The next step is mounting the production blisk in the machine and machining it. Therefore, it would have been obvious to a routineer in the art to have operated the two electrode pair machine in the same manner by first machining two rows of blades on a scrap blisk by using the two sets of electrodes and proceeding until the desired final dimensions were achieved.

Regarding claims 4 and 8, it would have been within the expected skill of a routineer in the art to have set the two machining electrodes in different locations (planes) within the machine as the apparatus itself is bulky and it would be highly difficult to arrange the second means such that it would not interfere with the first means. By setting up the two means in different planes relative to each other, a routineer in the art would have added means for translating the position of the blisk from one means to the other.

Regarding claim 5, it would have been within the expected skill of a routineer in the art to have set up the two machining electrodes to be movable into communication with a fixed blisk because each machining electrode means is bulky and would interfere with the other means. Thus, each of the machining electrodes would require translating means.

Regarding claim 6, Bruns et al teach (see col. 5, lines 20-40) rotating the electrodes during machining. Thus, Bruns et al disclose means for rotating the electrode pairs during machining.

Regarding claim 7 and 16, Applicant admits as prior art (see paragraph 15) that in tandem blisks, the two rows of blades have different sizes and configurations. Thus, it would have been obvious to set up the first machining electrodes to create the first row of blades and to set up the second machining electrodes to create the second row of blades in order to independently optimize the processing of each row of blades.

Regarding claims 9 and 10, Applicant admits (see paragraph 12) that the test blisk could be either the production blisk (i.e.-blisk sample is the same as the tandem blisk) or a scrap blisk (i.e.-blisk sample is a different part than the tandem blisk).

(10) Response to Argument

Appellant has argued that:

a. Hunter is not analogous art.

In response, the Examiner disagrees. Particularly, Appellant's argument that electrochemical machining and electrochemical etching are different processes is not founded in fact. Both are merely different names for the same process, which involves application of an electric current between a substrate and an opposing electrode, wherein an electrically conducting liquid is provided between the substrate and electrode, in order to electrochemically dissolve, atom-by-atom, the substrate to form a desired shape of the substrate. For this reason, Hunter et al is considered relevant to Appellant's field of endeavor. In support of the Examiner's position, Appellant's attention is brought to the US Patent Manual of Classification for class 205, in which subclass 640 is defined as Electrolytic Erosion of a Workpiece for Shape or Surface Change. A cursory search in this subclass would turn up references to both machining

and etching. Hence, the two names are merely preferential choice of inventors in referring to the same process. With respect to Applicant's reference to Bruns and Hunter having different classifications, a reclassification project was undertaken since the Bruns patent issued. A glance at the current classification of Bruns shows class 205, subclass 670 as being the primary classification. As can be seen, Hunter has a cross-classification in that very same subclass. Appellant has not provided any factual basis to the argument that the machining and etching processes are fundamentally different and that they utilize fundamentally different apparatus. Thus, since Hunter and Bruns are related to the same process, no "nexus" between Appellant's problem and the problem of Hunter is needed to be shown to consider Hunter analogous art.

b. Mitsuharu is not analogous art.

In response, the Examiner disagrees. Mitsuharu is related to electric discharge machining (US classification class 219, subclass 69.11+) and not electrochemical machining. The Examiner does not now assert that Mitsuharu relates to electrochemical machining [the Examiner did admit in the final rejection to misconstruing the teachings of Mitsuharu in the rejection mailed on 28 January 2005]. However, Mitsuharu is considered quite pertinent to Appellant's field of endeavor. It is related to the machining of blades on a turbine blisk. Thus, it is considered to be within Appellant's field of endeavor, machining turbine blades on a blisk and, hence, analogous and pertinent prior art.

A full English translation of Mitsuharu has been requested, and will be forwarded on to Appellant as soon as it is received. However, it is the Examiner's opinion that the

figures of Mitsuharu are sufficient to maintain the grounds of rejection. As the figures require no translation for one of ordinary skill in the art to comprehend, the Examiner is confident that the teachings of the figures of Mitsuharu are enough to convey to one of ordinary skill in the art the concept of using two sets of electrodes opposing each other in the machining of turbine blisks.

c. Both Hunter and Mitsuharu are related only to simultaneous machining, whereas Appellant's invention is directed to two machining steps in series.

In response, the Examiner has relied on the case law upon which he has been made aware, such case law stating that performance of two steps in sequence that had previously been performed simultaneously was an obvious variation. Without evidence of unexpected results, or newer case law by a higher authority countermanding that assertion, the Examiner believes that a prima facie case of obviousness can and should be maintained. Further with respect to this argument, the Examiner would like to clarify one point. The proposed modification of Bruns includes teachings from both Hunter and Mitsuharu. The teaching from Hunter is that multiple electrodes can be used to machine multiple geometries. The teaching of Mitsuharu is to use two opposing sets of electrodes to perform two machining operations on a blisk. Thus, the modification of Bruns is to use two sets of electrodes, as taught by Mitsuharu, to machine two different geometries, i.e.-rows of blades, as taught by Hunter.

d. The rejection of claims relies on hindsight.

In response, any rejection of claims necessarily relies on hindsight. The test is whether the rejection includes improper hindsight. The Examiner contends that there is

no improper hindsight in the present rejections because the rejection grounds only rely on the teachings of the prior art.

e. The motivation to combine does not come from the references.

In response, the Examiner disagrees. The motivation to combine the references comes from the express and implicit teachings of the prior art. Mitsuharu expressly teaches performing two machining operations on a blisk using opposing sets of electrodes. Hunter expressly teaches use of multiple electrodes to perform machining of different geometries (i.e.-shapes) and implicitly teaches an improvement in efficiency provided thereby.

f. The Examiner has not provided a factual basis for why one of ordinary skill in the art would have placed the two sets of working electrodes in different planes and to have included translating means for moving the blisk between the two offset planes.

With respect to Appellant's arguments regarding claim 13 (and similarly, claims 4 and 8), the Examiner contends that one of ordinary skill in the art would have found it obvious to place the second working electrode pair in any relation to the first, even one where the two working electrode pairs were offset from one another. See MPEP 2144.04.VI.C. Further in support of the Examiner's position is the absence of evidence of an improvement achieved by this arrangement. Where is the unexpected result from placing the working electrode pairs in different planes? Where is the advantage of using a translating means for moving the blisk between the two planes? Absent evidence of unexpected results, the Examiner cannot allow the prima facie case of

obviousness to be overcome. Attention is directed to paragraph 71 of the specification where it is stated that the translation along axis W was conventional in the prior art. As such, it is not considered inventive in this instance to use a conventional translation device that was used in the prior art for the same purpose as the prior art device.

g. Claims 14 and 5 are not taught by the prior art.

In response, the claims would have been considered obvious in view of the teachings above. Further, it is noted that Bruns et al teach (see figures 2 and 3) means 60, 64 for moving the electrode tools in a direction towards to blisk, i.e.-in a direction parallel to direction Z as indicated in figure 2 of Bruns et al and figure 1 of the present application. Thus, in addition to the rejection grounds presented above, Bruns et al teach the claimed translating means.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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